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ABSTRACT

A double perspective is offered on computer-assisted instruction (CAI): (1) a definition is provided, the role of a computerized component in an ESL curriculum is examined, and the potential of computerized learning in the ESL field is explored; and (2) the CAI program at Strayer College in Washington, D. C. is described. The definition proposed is the use of a computer in enhancing the learning and mastery of a specific skill. Because of CAI's versatility and provision for individualization, several advantages of this type of instruction are discovered: (1) errors can be analyzed and positive reinforcement given; (2) testing can become a learning process; and (3) it can provide almost unlimited opportunity for drill and practice. Almost any written material can be adapted for computer exercises using the drill and practice, tutorial, testing, dialogue, or simulation and gaming modes. The computer learning program at Strayer College is mainly employed in the drill and practice mode and is used along with classroom instruction. The other instructional modes are used as well and are described briefly. Several computer exercises are appended. (AMH)

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COMPUTER-ASSISTED INSTRUCTION IN THE ESL CURRICULUM

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Washington, D.C.

Paper Presented at the Conference of the Washington Area Teachers of English to Speakers of Other Languages

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Computer-assisted instruction or computer-aided instruction, the use of a computer for pedagogical purposes, has recently begun to command a great deal of attention in the field of language learning. Although computer-assisted instruction, commonly referred to as CAI, often invokes a forbidding picture of super-technology sometimes considered beyond the realm of the humanist, computerized learning has proven to be an extremely verstile tool in the learning and teaching of languages.

This presentation will offer a double perspective concerning CAI. On a theoretical level, we will provide a manageable definition of CAI, examine the role of a computerized component in an ESL curriculum, and explore the potential of computerized learning in the ESL field. On a practical level, we intend to familiarize you with the manner in which a computerized component can be successfully integrated into an ESL program, referring specifically to the CAI program currently in operation at Strayer College in Washington, D.C.

In attempting to formulate a working definition of computer-assisted instruction, it can be said that CAI is, fundamentally, the use of a computer, any type of computer, in enhancing the learning and mastery of a specific skill. CAI has long been utilized in scientific and technical fields; however, it is only within recent years that computerized instruction has been considered advantageous to

the language learner. There can be little doubt that CAI is an idea whose time has come. This fact is evidenced by a growing body of literature and increasing implementation of CAI on a practical level. John Allen of Dartmouth, a pioneer in the CAI field, categorically states, "The use of a computer in helping teach languages will increase in years to come: it has already been shown too effective to be ignored."[1]

Among the many examples of CAI programs in the field of foreign languages we may cite those at the State University of New York at Stony Brook, Dartmouth University, Stanford University, the University of Illionis, Brigham Young University, and Westchester State College. Of the aforementioned, very few, to our knowledge, have incorporated computer-assisted instruction for the ESL student.

There are several types of computer systems which can be employed in a CAI program. One type is the general purpose computer, a main frame or mini computer, generally utilized by public school systems, colleges and universities. Most CAI programming for this type of computer is written in BASIC. Another type of computer is the microcomputer. Microcomputers are relatively inexpensive peronal computers which often also utilize BASIC for programming. A third type of educational computer is PLATO (Programmed Logic for Automatic Teaching Operations),

a time-sharing system developed by Control Data Corporation in conjunction with the University of Illinois. PLATO utilizes its own programming language called TUTOR. A final computer system popular for educational purposes is TICCIT (Time Shared Interactive Computer Controlled Information Television). TICCIT was developed under the auspices of the National Science Foundation by the Mitre Corporation in conjunction with the University of Texas and Brigham Young University.

Although each of these systems may differ with respect to inherent capability, special features, and type of terminal utilized, all share a fundamental goal: the use of a computer to provide effective and pedagogically sound instruction. CAI has certain inherent qualities which facilitate the realization of this goal.

CAI provides a high degree of individualization as instruction is self-paced. In addition, the student may choose what he wants to study or review, and often has the option of determining the number and difficulty of the questions to be answered. Because the CAI environment provides "privacy of communication and time,"[2] the student is evaluated by the computer on the basis of his individual performance. Thus negative peer and teacher feedback is eliminated. One positive result of such individualization, according to Peter Rosenbaum of the Language Learning Group of the IBM Watsen Research Center, is that the number of

student interactions in the target language is increased tenfold as compared to the number of such interactions in the traditional classroom.[3]

Another positive quality of CAI is the degree of humanization and personalization which may be achieved by means of creating a dialogue, or "computerlogue", between student and computer. To achieve a high level of personal communication, students may be addressed by name, and personal information about each student may be incorporated into the program. Moreover, humor, creativity, and special effects, such as sound and graphics, may provide the backdrop for a high rate of student success with the medium.

A third advantage of CAI is that immediate positive reinforcement, as well as guided error messages, may be provided. Errors can be extensively analyzed, thus providing the student with a clear conception of his individual weaknesses. Students may also be guided to an easier or more difficult exercise according to individual performance.

Another advantage of CAI is that testing can become a learning process. Testing by computer provides greater flexibility than that of the traditional classroom setting as the computer is well-suited to handle many testing variations, such as random presentation of questions, repetition of errors, or practice testing.

CAI is advantageous to the teacher as well as to the student. The computer can provide almost unlimited opportunity for drill and practice and can do so with infinite patience. Thus the teacher is free to teach more creative and stimulating materials and to focus on concepts, abstract relationships, data analyses, etc. In addition, the instructor can take advantage of the automatic record keeping and error analysis functions that can be built into a CAI program, providing further insight into the individual problems and needs of the students.

It is important, however, that CAI not be viewed as the ultimate teaching system. There are some disadvantages of CAI. For example, at the present time, CAI systems for the practice of oral/aural skills are in their infant stage. Students who do not learn well by means of visual stimuli are therefore at a disadvantage. In addition, some students, however small a percantage, do not respond well to the mechanical aspects of CAI.

In contrast, other criticism levied against CAI does not ring true. One misconception is that CAI is synonomous with programmed learning. CAI is designed to help the learner determine the correct response and master the skill in question. It is not limited, as is programmed learning, to a simple statement of error.

Another misconception is that CAI cannot anticipate varied student responses. In fact, detailed error analysis can be formulated so that common errors can be anticipated and appropriate responses provided. For example, if programmed to do so, the computer can and will judge whether an error is orthographic, syntactical, or morphological.

In response to the criticism that CAI does not develop critical thinking, Phillip Grundlehner, of the University of Illinois, affirms that "computer-based instruction has often been found to be more effective than standard educational procedures in many learning situations that call for judgement, interpretation of complex problems, and evaluation by students of the validity of their conjuctures."[4]

Along the same lines, other criticism accuses CAI of merely being an expensive toy that provides no significant benefit to the learner. On the contrary, based on statistical performance studies, Rosenbaum, Morrison, and Adams, all of the IBM Watsen Research Center, concluded that for "foreign language instruction, well-conceived computer-assisted instruction may turn out to be a revolutionaty development in instructional methodology."[5]

Regarding cost, although at the present time we are unable to provide a detailed analysis, the cost of running a CAI program on a general purpose computer is greatly reduced as CAI is but one of the many functions performed by the

computer. Furthermore, the relatively low cost of microcomputers facilitates their accessibility.

A final misconception is the idea that the computer is designed to usurp the role of the teacher. Rather, CAI should be viewed as the text of the future--an aid in the teaching of languages that by no means jeopardizes the special relationship established between teacher and student. If anything, CAI enhances this relationship by providing heightened motivation on the part of the student, and by extension, on the part of the teacher. A further advantage is the fact that even in such a highly individualized learning environment, the teacher can remain in control of the learning process by careful integration of CAI and classroom material.

In planning a CAI program it is important to keep in mind that such a program, unlike a textbook, need not be complete in order to be functional. CAI can, of course, serve as a self-contained unit in the tutorial mode where the computer acts as instructor. Nonetheless, when employed as an adjunct to the traditional classroom, CAI may be viewed as one among many pedagogical tools. Thus, the computer program can develop and expand in accordance with student needs.

As in designing a curriculum, sound pedagogical procedures concerning the development and presentation of content and the mediation and supervision of material should

be followed. There are no good computers or bad computers; there is, however, good CAI and bad CAI. In designing computer exercises certain aspects unique to computer instruction must be considered: directions should be presented clearly and concisely, the exercise should be "cosmetically" pleasing, that is, well formulated and well-displayed, and mechanical procedures should be kept to a minimum. Also, exercises should be well-planned in order to direct the efforts of individual students in such a way as to insure optimum learning. Therefore the number of attempts per item, criteria for student progress, availability and presentation of remedial instruction, and time limits, if any, must all be carefully considered as options prior to actual programming. Exercises may include some or all of the aforementioned possibilities.

Most CAI exercises utilize the drill and practice, tutorial, testing, dialogue, or simulation and gaming modes either exclusively, or in combination. This allows almost any written material to be adapted for computer learning. Because the computer is perfectly suited to drill and practice, CAI exercises tend to employ multiple choice or fill-in answers. However, other types of meaningful exercises, including matching, semi-free response, and translation are possible. Even if exercises rely on a multiple choice device to elicit the answer, they need not be limited to structural practice. Exercises utilizing multiple choices may be designed to develop judgement and

critical thinking, as do those dealing with paraphrase or notional/functional concepts.

Computer-assisted instruction provides a multitude of choices and does not require constant revision on the part of the teacher. Questions may be presented randomly from a large data base so that each student will be assured a variety of questions. This also allows a particular student to do the same exercise several times without exact repetition of particular items. Students need not complete an exercise if sufficient mastery is demonstrated. The computer may automatically branch the student to an exercise more appropriate to the individual's level of mastery. The student may also contract for a particular grade or a predetermined number of questions. The exercise may be viewed as practice or as a test. Time limits may or may not be imposed. As one can readily see, the possibilities for CAI design are endless.

Another important aspect of exercise design is game playing. The appeal of challenging a computer is undeniable. For a CAI program, language games such as hangman, password, or bingo may be successfully adapted for ESL purposes. In addition, any exercise may be presented as a challenge match between the student and the computer. Moreover, traditional computer games, such as the adventure series, can be incorporated as positive reinforcement upon student achievement of of a certain level of mastery.

Particularly interesting variations on the adventure theme involve adapting these games to situations pertinent to the life experience of the ESL student.

CAI can assist in the mastery of grammatical, vocabulary, reading comprehension, and writing skills. Although writing skills may presently be among the most difficult to adapt for a CAI program, exercises dealing with concepts such as recognition of topic sentences, developmental organization, sentence structuring, transitions, and punctuation can be created. Other exercises may also be designed for more abstract and creative purposes, such as programs which explain and elicit figures of speech by Ellen Nold of the University of California.[6]

The CAI program at Strayer College primarily functions as an actively supervised computer lab. The ESL instructors, all of whom are familiar with the range of programs available, may assign specific drills in conjuction with the material taught in class. They may assign remedial work to specific students as well. Quite often, students are permitted to choose their own programs and individual students may use the computer at any time, provided there is a terminal available. The computer learning program at Strayer College is thus mainly employed in the drill and

practice mode and used in conjunction with classroom instruction. Nonetheless, there is a variety of programs designed in the tutorial mode, and these have proven to be quite effective both with individual students and with groups.

While the active participation of the instructor in the ESL computer lab is not absolutely essential, we have found it to be extremely beneficial to both student and teacher. In the lab, the instructor serves as a roving advisor, providing additional explanations, correcting errors, and the like. In addition, the ESL learner may be assisted by other college students working at the terminals. This situation has proven, quite unexpectedly, to be an added benefit for the ESL student in that it affords him the opportunity to communicate with native speakers, other than the ESL instructor, in the target language.

The LOGIN prodecure, giving access to the system, has been streamlined for the ESL student in order to reduce the possibility of technical errors. The students are required to type only two commands to gain access to the ESL material. The first command activates the system; the second calls up the "menu", a list of the units of study available to the student. Each unit listed represents a grammatical category or specific language skill. These individual units are presented in small segments and the exercises within the units are graded according to

difficulty. Students working individually are thus afforded a choice of the area to be studied. Once the student types the number of the unit he wishes to study, the individual exercises within that unit are listed with a brief description. Upon choosing the number of the exercise, the student may begin work.

A high degree of personalization is afforded within the individual programs. The student is addressed by name, and personal questions relating to the student's family, country of origin, hobbies, etc. may be asked. An automatic "end" command, which takes the student out of the exercise and back to the unit, the menu, or out of the system, has been programmed into each of the exercises. In most of the exercises the questions are presented randomly. This feature is extremely beneficial, particularly when an entire group is working on the same exercise, or when the computer is used for testing.

If the learner has given an incorrect response, he is afforded the opportunity to correct it. The student generally receives a guided error message which indicates the area of difficulty. Possible variations of answers are, of course, programmed into the exercise. Many of the programs allow the student access, at his discretion, to an explanation of the material at hand. This feature allows the student to choose the mode to which he is most suited, either drill and practice or tutorial, while allowing a

certain measure of self-pacing. Each of the programs is designed to be as aesthetically pleasing as possible, given the graphic and auditory limitations of the system. The element of sound has been incorporated to a small degree through the use of the bell.

Each exercise is automatically scored and the student is presented with a personalized message indicating his performance. At this juncture, the errors are repeated, or if the individual has not achieved a predetermined level of mastery, he is branched to a repetition of the exercise. The random presentation of items assures that the new version of the exercise will not be identical to the one just completed. Eventually, this feature could be developed into a contractual grading system whereby the student is given the option to contract for a specific grade by choosing the number of questions to be answered. Upon completing the exercise, the student is afforded the opportunity to continue studying the same unit, choose another area of study, or terminate his work in the CAI lab.

As stated above, the CAI program at Strayer College is primarily employed in the drill and practice mode as an adjunct to classroom instruction. As such, it is extremely well-integrated into the program as a whole. The use of the tutorial mode is growing as well, and the various exercises programmed in this mode have met with great success.

The use of the dialogue mode in this program is, at present, somewhat limited. Several conversational and introductory programs make use of this mode, as do the personalized comments in other programs. Student input in these programs is somewhat restricted, yet this limitation has proven effective in teaching the students appropriateness of response when using the computer. In addition, it provides a valuable lesson in direction-taking, a fundamental skill for the ESL learner.

The conversation programs have been designed to put the first-time user of the computer at ease with the medium, as well as to acquaint the individual with the mechanical aspects involved in using a computer in a learning situation. In these programs the student is sometimes addressed in his own language. Virtually any language which employs Roman characters may be used. Microcomputers, with the capability of high resolution graphics, are able to utilize other languages as well.

The purpose of the simulation and gaming mode as it is employed in the CAI program at Strayer College is to provide positive reinforcement for high performance or to heighten interest in a particular field of study. A series of exercises dealing with paraphrasing has been programmed in the gaming mode. In some of the games, skill-related explanations are presented as part of the game, thus combining the tutorial and gaming modes in one exercise.

A testing program has recently been incorporated into the overall CAI program at both the beginning and intermediate levels. Proficiency exit tests of a comprehensive nature have been developed and administered on an experimental level. Although no formal statistical study has been conducted, student performance on these tests has proven to be consistent with overall performance as evaluated by individual instructors on the basis of in-class activities and traditional testing methods. The fact that the students were already familiar with the use of the computer through their experience with the CAI lab served to minimize the incidences of technical errors.

The response of both teachers and students to the implementation of a computer-assisted instruction component in the ESL curriculum at Strayer College has been overwhelmingly positive. The overall student reaction has also been extremely enthusiastic. Once familiar with the computer mechanism, students appreciate the individualized aspects of working with a computer. Self-pacing, the possibility of remedial aid, and unlimited practice are often mentioned as positive qualities. In addition, the medium provides a high degree of motivation -- particularly in view of the gaming aspects. Indeed, instructors are inundated with requests for additional computer lab time. Students react so well with the computer that they are often reluctant to leave the lab and attempt to continue working by endeavoring to engage the computer in conversation after

the completion of the exercises.

Instructor response has evolved from an initial attitude of indifference to one of enthusiastic approval. As a result of growing familiarity with CAI, instructors now make extensive use of the program and frequently take an active role in the formation and development of exercises. Furthermore, as the instructor acts as a roving advisor during the actual lab period, he is able to provide additional individualized attention to the students. The teacher is thus afforded the opportunity to gauge student response and performance first-hand. The teachers serve as an important resource to the CAI developers by suggesting modifications for existing programs and offering ideas for future projects. The active participation of the instructor in the computer lab thus provides another positive aspect of CAI that is not generally mentioned in the literature concerning this field. Such positive feedback on the part of the instructors, coupled with student enthusiasm, has resulted in the complete integration of the CAI program into the ESL curriculum as a whole.

The great majority of current CAI materials, excluding those developed for PLATO and TICCIT, are at present, being created in-house: that is, written and utilized within the confines of specific organizations. However, we are

confident that within the near future not only will general CAI exercises be commercially available, but supplementary material for particular texts will be marketed, much as tapes and workbooks are now. The potential of computer-assisted instruction is virtually unlimited. As software becomes more sophisticated, increasingly complex ideas can and will be presented in previously unavailable forms. It is time for us as educators to take an active interest in computer learning and the development of effective CAI so that we may help determine the future of educational technology in the ESL field.

NOTES

[1]John R. Allen, "The Use of a Computer in Drilling," Die Unterrichtspraxis, 5 (1972), 35.

[2]Ellen W. Nold, "Fear and Trembling: The Humanist Approaches the Computer," College Composition and Communication, 26 (Oct., 1975), 271.

[3]Peter S. Rosenbaum, "The Computer as a Learning Environment For Foreign Language Learning," Foreign Language Annals, 2 (May, 1969), 458.

[4]Phillip Grundleher, "PLATO: German Reading, English as A Second Language, and Bilingual Education," System, 2 (May, 1974), 70.

[5]Rosenbaum, p. 463.

[6]Nold, pp. 270-272.

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HI. MY NAME IS PRIME T. COMPUTER. THANK YOU FOR VISITING ME.
HERE IS THE MENU--A LIST OF THE DIFFERENT TYPES OF EXERCISES
YOU CAN STUDY.

TO SEE THE EXERCISES WRITE THE NUMBER (1,2,3,ETC.) YOU WANT TO SEE.
------

1) ADJECTIVES
2) DEFINITE, INDEFINITE ARTICLES
3) BEGINNING VERBS-DO,BE,HAVE
4) CONVERSATION WITH COMPUTER
5) CONDITIONALS, CONTRARY TO FACT
6) MISC. EASY MATERIAL
7) MISC. ADVANCED MATERIAL
8) MODALS
9) PARAPHRASE
10) PASSIVE VOICE
11) PAST TENSE
12) PERFECT TENSES
13) PREPOSITIONS
14) PRESENT TENSE
15) INTERROGATIVES, TAGS
16) READING COMP.
17) RELATIVE CLAUSES
18) SPELLING
19) SYNTAX, PARTS OF SENTENCE
20) THERE IS/THERE ARE
21) 2 WORD VERBS
22) VERB REVIEW
23) VOCABULARY

!9
HELLO. IT"S NICE TO SEE YOU. THIS IS A UNIT ON PARAPHRASING.
THE FOLLOWING EXERCISES ARE AVAILABLE.

PLEASE CHOOSE THE NUMBER OF THE EXERCISE YOU WANT TO DO.

1) PARA1: ADDITION,SUBSTITUTION,DELETION,MOVEMENT

2) PARA2: CHOOSE THE CORRECT APHRASE

!2

HI. MY NAME IS PRIME. I"M HERE TO HELP YOU

HI. MY NAME IS PRIME. I"M HERE TO HELP YOU
LEARN ENGLISH.

I HOPE TO SEE YOU OFTEN.

PLEASE TELL ME YOUR FIRST NAME.

!ELENA

WELL, ELENA. I"M VERY VERY GLAD TO MEET YOU.

WHERE ARE YOU FROM?

!MEXICO

I"VE HEARD THAT MEXICO IS A BEAUTIFUL COUNTRY.
I"VE NEVER BEEN THERE, BUT WOULD LIKE TO GO ONE DAY.

WHAT IS YOUR NATIVE LANGUAGE?
!SPANISH

QUE BIEN! TAMBIEN HABLO ESPANOL. ME ALEGRO MUCHO DE VERTE.

HOW LONG HAVE YOU BEEN IN THE U.S.?

!3 WEEKS

I HOPE YOU"RE GETTING ACCUSTOMED TO LIFE HERE.

DO YOU LIKE AMERICAN FOOD?

!YES

I DO TOO. MY FAVORITE MEAL IS A HAMBURGER AND FRENCH FRIES.

HAVE YOU SEEN MANY PLACES IN WASHINGTON?

!NO

YOU SHOULD VISIT THE WHITE HOUSE AND THE SMITHSONIAN.
I"D BE HAPPY TO TAKE YOU.

ARE YOU MARRIED?

!NO

WOULD YOU LIKE TO GO OUT WITH ME ON SATURDAY NIGHT?

THAT"S ALL FOR TODAY. I THINK WE SHOULD GET TO WORK NOW.
BYE, ELENA PLEASE COME BACK SOON.

ESPERO VERTE DENTRO DE POCO. HASTA PRONTO, ELENA.

DO YOU WANT TO STUDY ANOTHER EXERCISE IN THIS UNIT?
!NO
DO YOU WANT TO STUDY SOMETHING ELSE?
!NO
BYE. PLEASE COME BACK AND VISIT ME SOON.

```
OK, BASIC



OK, BASIC
BASIC REV17.0
>LOAD 'CONREAD3'
>RUN
PLEASE WRITE YOUR FIRST NAME.

!PABLO

WELL, PABLO, I"M GLAD YOU CAME TO STUDY WITH ME TODAY.
IN THIS EXERCISE YOU WILL READ A SHORT ESSAY ABOUT COMPUTERS.
THE ESSAY WILL BE FOLLOWED BY VOCABULARY QUESTIONS AND READING
COMPREHENSION QUESTIONS.  I HOPE YOU LEARN SOMETHING FROM YOUR
WORK WITH THE COMPUTER TODAY.

FIRST READ THE ESSAY CAREFULLY.  THEN ANSWER THE QUESTIONS.
IF YOU WANT TO SEE THE ESSAY AGAIN TO HELP YOU ANSWER THE QUESTION,
WRITE THE WORD  ESSAY.
                -----
AFTER EACH QUESTION, CHOOSE THE NUMBER OF THE BEST ANSWER.
                                  ------
WHEN YOU ARE READY TO SEE THE READING WRITE OK.
!OK
     It is exceedingly useful for computer and business students
to be familiar with the history of computers.  This will help
students understand the impact, or effect, cf computers on
technology and society.
     The Scientific Revolution, which began around the year 1543
and culminated in 1687, marked the beginning of the modern age of
science.  During this time people began to believe certain things
that we still believe today.  For instance, the idea that the
universe functions according to mathematical rules became wide-
spread at this time.  These laws explain how things work.  For
this reason, people began to believe that the universe functions
like a machine and that science is a very significant part of
society.  Modern science is also characterized by the belief that
machines are useful because they save labor.  This work-saving aspect
of machines also helps make science and technology very important.
     During this time two men invented the first calculating machines.
These men, Blaise Pascal and Gotfried Liebnitz, understood that
machines could help mathemeticians and businesses save time and money.
     In 1687, the famous scientist, Isaac Newton, gave a definition
of the laws of nature and the Scientific Revolution was complete.

WRITE OK WHEN YOU ARE READY TO CONTINUE.
!OK

**********************************************************************
CHOOSE THE NUMBER OF THE WORD WHICH IS CLOSEST IN MEANING TO THE FIRST
WORD.
**********************************************************************

CALCULATING
1.  ARITHMETIC          2.  COMPUTERIZED          3.  MANUAL
!1
WHAT A GENIUS YOU ARE!
```



```
LABOR
```

OK, BASIC

1. WORK 2. TIME 3. MONEY
!1
I THINK YOU ARE VERY, VERY SMART.

SIGNIFICANT
1. USEFUL 2. IMPORTANT 3. PERIPHERAL
!2
YOU ARE A COMPUTER WHIZ!

CHARACTERIZED
1. THOUGHT 2. DESCRIBED 3. UNDERSTOOD
!2
WHAT A GENIUS YOU ARE!

IMPACT
1. USE 2. NEED 3. EFFECT
!1

NO, THAT IS NOT THE CORRECT ANSWER. THINK IT OVER AND TRY AGAIN.

!ESSAY
It is exceedingly useful for computer and business students to be familiar with the history of computers. This will help students understand the impact, or effect, of computers on technology and society.

The Scientific Revolution, which began around the year 1543 and culminated in 1687, marked the beginning of the modern age of science. During this time people began to believe certain things that we still believe today. For instance, the idea that the universe functions according to mathematical rules became widespread at this time. These laws explain how things work. For this reason, people began to believe that the universe functions like a machine and that science is a very significant part of society. Modern science is also characterized by the belief that machines are useful because they save labor. This work-saving aspect of machines also helps make science and technology very important.

During this time two men invented the first calculating machines. These men, Blaise Pascal and Gotfried Liebnitz, understood that machines could help mathemeticians and businesses save time and money.

In 1687, the famous scientist, Isaac Newton, gave a definition of the laws of nature and the Scientific Revolution was complete.

WRITE OK WHEN YOU ARE READY TO CONTINUE.
!OK

NOW PLEASE ANSWER THE QUESTION.
IMPACT
1. USE
2. NEED
3. EFFECT
!3
I THINK YOU ARE VERY, VERY SMART.

TO INVENT

```
OK, BASIC


1.  TO THINK  2.  TO BELIEVE              3.  TO CREATE
!3
YOU ARE A COMPUTER WHIZ!


EXCEEDINGLY
1.  A LITTLE  2.  EXTREMELY 3.  SOMEWHAT
!2
WHAT A GENIUS YOU ARE!


TO FUNCTION
1. TO MAKE    2.  TO WORK   3.  TO DO
!2
I THINK YOU ARE VERY, VERY SMART.


TO MARK
1.  TO THINK  2.  TO HAVE   3. TO SIGNIFY
!3
YOU ARE A COMPUTER WHIZ!


TO CULMINATE
1.  TO END    2.  TO START  3.  TO BECOME
!1
WHAT A GENIUS YOU ARE!


ACCORDING TO
1.  ABOUT     2.  COMING TO 3.  FOLLOWING
!3
I THINK YOU ARE VERY, VERY SMART.


TO BE FAMILIAR WITH
1.  TO KNOW ABOUT             2.  TO SEE    3.  TO BE USEFUL
!1
YOU ARE A COMPUTER WHIZ!


RULES
1.  INSTRUCTIONS              2.  DIRECTIONS            3.  LAWS
!3
WHAT A GENIUS YOU ARE!


DEFINITION
1.  EXPLICATION               2.  DECISION  3.  THOUGHT
!1
I THINK YOU ARE VERY, VERY SMART.


ASPECT
1.  MACHINE   2.  FEATURE   3.  PROBLEM
!2
YOU ARE A COMPUTER WHIZ!
```

OK, BASIC

****
CHOOSE THE NUMBER OF THE STATEMENT WHICH BEST COMPLETES THE SENTENCE OR ANSWERS THE QUESTION.
****

WHO GAVE A DEFINITION OF THE LAWS OF NATURE?
1. BLAISE PASCAL
2. GOTFRIED LIEBNITZ
3. ISAAC NEWTON

!ESSAY

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WRITE OK WHEN YOU ARE READY TO CONTINUE.
!OK

NOW PLEASE ANSWER THE QUESTION.
WHO GAVE A DEFINITION OF THE LAWS OF NATURE?
1. BLAISE PASCAL
2. GOTFRIED LIEBNITZ
3. ISAAC NEWTON
!3
WHAT A GENIUS YOU ARE!

WHAT DID BLAISE PASCAL AND GOTFRIED LIEBNITZ INVENT?
1. CALCULATING MACHINES
2. COMPUTERS
3. CALCULATORS

!1
I THINK YOU ARE VERY, VERY SMART.

DURING THE SCIENTIFIC REVOLUTION PEOPLE BEGAN TO BELIEVE THAT _____.
1. SCIENCE SHOULD BE SEPARATE FROM SOCIETY
2. SCIENCE IS AN INTEGRAL PART OF SOCIETY
3. SCIENCE AND SOCIETY ARE THE SAME THING

OK, BASIC

!2
YOU ARE A COMPUTER WHIZ!

KNOWING THE HISTORY OF COMPUTERS WILL _____.
    1. HELP STUDENTS A GREAT DEAL
    2. HELP STUDENTS ONLY A LITTLE
    3. WILL NOT BE USEFUL TO STUDENTS AT ALL

!1
WHAT A GENIUS YOU ARE!

THE DEFINITION OF THE LAWS OF NATURE MARKED _____.
    1. THE END OF THE SCIENTIFIC REVOLUTION
    2. THE BEGINNING OF THE SCIENTIFIC REVOLUTION
    3. THE END OF THE MODERN AGE OF SCIENCE

!2

YOU MUST BE SLEEPY TODAY. TRY TO GET THE RIGHT ANSWER THIS TIME.

!1
I THINK YOU ARE VERY, VERY SMART.

ONE OF THE BELIEFS OF THE MODERN AGE OF SCIENCE IS THAT_____.
    1. ALL MEN ARE CREATED EQUAL
    2. THINGS HAPPEN BY CHANCE
    3. EVERYTHING WORKS ACCORDING TO MATHEMATICAL LAWS

!3
YOU ARE A COMPUTER WHIZ!

THE MODERN AGE OF SCIENCE BEGAN _____.
    1. BEFORE THE SCIENTIFIC REVOLUTION
    2. MORE THAN 300 YEARS AGO
    3. IN THE TWENTIETH CENTURY

!2
WHAT A GENIUS YOU ARE!

ONE OF THE BELIEFS OF MODERN SCIENCE IS THAT _____.
    1. MACHINES ARE NOT VERY HELPFUL
    2. MACHINES ARE USEFUL BECAUSE THEY SAVE WORK
    3. MACHINES WILL TAKE OVER OUR LIVES

!1

DO YOU FEEL ALRIGHT? PLEASE TRY AGAIN.

!3
NO, PABLO, THAT"S NOT RIGHT EITHER. THE CORRECT ANSWER IS: 2.

WHAT ASPECT OF MACHINES MAKES SCIENCE AND TECHNOLOGY VERY IMPORTANT?

OK, BASIC

1. THEY CAN SAVE ANSWERS
2. THEY ARE EASY TO USE
3. THEY SAVE LABOR

!3
I THINK YOU ARE VERY, VERY SMART.

THE SCIENTIFIC REVOLUTION LASTED _____.
1. FOR LESS THAN 100 YEARS
2. FOR MORE THAN 100 YEARS
3. FOR EXACTLY 100 YEARS

!2
YOU ARE A COMPUTER WHIZ!

WELL, PABLO, THAT"S THE END OF THE EXERCISE.

YOU GOT 88 % ON THE EXERCISE.

THAT IS PRETTY GOOD. LET"S REPEAT THE QUESTIONS YOU MISSED.

IMPACT
1. USE
2. NEED
3. EFFECT
!3
HURRAY! I KNEW YOU WOULD GET IT RIGHT THIS TIME.

THE DEFINITION OF THE LAWS OF NATURE MARKED _____.
1. THE END OF THE SCIENTIFIC REVOLUTION
2. THE BEGINNING OF THE SCIENTIFIC REVOLUTION
3. THE END OF THE MODERN AGE OF SCIENCE
!1
HURRAY! I KNEW YOU WOULD GET IT RIGHT THIS TIME.

```
OK, BASIC



ONE OF THE BELIEFS OF MODERN SCIENCE IS THAT _____.
    1.  MACHINES ARE NOT VERY HELPFUL
    2.  MACHINES ARE USEFUL BECAUSE THEY SAVE WORK
    3.  MACHINES WILL TAKE OVER OUR LIVES
!2
HURRAY! I KNEW YOU WOULD GET IT RIGHT THIS TIME.

DO YOU WANT TO STUDY ANOTHER EXERCISE IN THIS UNIT?
!NO
COME BACK SOON, PABLO.

END AT LINE 2260
>COMO EEND
COMO -END
  ^ID
>
QUIT.
OK, COMO -END
```